

SECTION 15300
FIRE SUPPRESSION MASTER SPECIFICATION

PART 1 - GENERAL

1.1 REFERENCES

- A. The Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. ANSI
1. ANSI B 16.1-89, Cast Iron Pipe Flanges and Flanged Fittings
 2. ANSI B 16.3-92, Malleable Iron Threaded Fittings
 3. ANSI B 16.5-88, Pipe Flanges and Flanged Fittings; Addenda B16.5A-92
 4. ANSI B 16.9-93, Factory Made Wrought Steel Buttwelding Fittings
 5. ANSI B 16.11-91, Forged Fittings, Socket-Welding and Threaded
 6. ANSI B 16.14-91, Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads
 7. ANSI B 16.21-92, Nonmetallic Flat Gaskets for Pipe Flanges
 8. ANSI B 16.39-86, Malleable Iron Threaded Pipe Unions Classes 150, 250 and 300
 9. ANSI B 36.10-85, Welded and Seamless Wrought Steel Pipe
- C. ASTM
1. ASTM A47-90, Standard Specification for Ferrite Malleable Iron Castings
 2. ASTM A53-93a, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
 3. ASTM A105-94, Standard Specification for Forgings, Carbon Steel, for Piping Components
 4. ASTM A126-93, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 5. ASTM A135-93, Standard Specification for Electric Resistance Welded Pipe
 6. ASTM A153-82, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware (R 1987)
 7. ASTM A181-94, Standard Specification for Forgings, Carbon Steel, for General Purpose Piping
 8. ASTM A197-87, Standard Specification for Cupola Malleable Iron (R 1992)
 9. ASTM A234-94, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
 10. ASTM A563-94, Standard Specification for Carbon and Alloy Steel Nuts
- D. NFPA
1. NFPA 1 Standard Fire Prevention Code (1997)
 2. NFPA 13 Installation of Sprinkler Systems (1996)
 3. NFPA 14 Installation of Standpipe and Hose Systems (1996)
 4. NFPA 70 National Electric Code (1996)
 5. NFPA 72 National Fire Alarm Code (1996)
 6. NFPA 75 Electronic Computer/Data Processing Equipment (1995)
 7. NFPA 101 Life Safety Code (1997)
 8. NFPA 318 Protection of Cleanrooms
- E. OAK RIDGE NATIONAL LABORATORY DESIGN DOCUMENTS
1. ORNL Design Criteria –Fire Protection-Deviations – NFPA 13 and NFPA 101
 2. ORNL Technical Specification Section 15104A Fire Protection 4-24-96
 3. ORNL Technical Specification Section 16721 Fire Alarm Systems 4-2-97

F. OTHER

Standard Building Code (1997)

1.2 GENERAL REQUIREMENTS

- A. Purpose: This Section describes the design, equipment, material, installation, acceptance testing, manuals and training for the fire suppression systems which are required for the protection of property and life safety at the Center for Nanophase Materials Science (CNMS) Facility which is being constructed for the Department of Energy at Oak Ridge, Tennessee. The overall specification outlines system requirements for various suppression systems. The appendix details the specific performance requirements and system applicability for each of the buildings that make up the CNMS project. This performance specification outlines the requirements for fire suppression system design and operation. This is a "design-build" turnkey project. The Contractor shall provide the Construction Manager with a completed system designed in accordance with the requirements presented in each Specification section.
- B. Design: System shall be designed, installed and tested in accordance with the requirements of this specification, as well as, NFPA 13, 14 and other appropriate codes and standards. Backflow preventors shall be installed in each riser room prior to the sprinkler or standpipe system piping. All valves controlling water supplies to the suppression systems and backflow preventers shall be fitted with tamper switches for valve supervision. Design of drainage for fire suppression system and backflow preventer flushing and testing shall allow for full flow testing.
- C. Terminology: Terminology used in this specification is as defined in NFPA 13, 14, and as described in various referenced sections or appropriate codes and standards.
- D. Service Conditions
 1. Items provided under this section shall be specifically suitable for the following service conditions.
 - a. Altitude: 1,000 feet
 - b. Ambient Temperature: -20 to 110 degrees F
 - c. Seismic Parameters: Addressed in the Appendices, as necessary, for each protected structure/building.
 - d. Site Water Supply. Fire protection water supply for the CNMS Site is potable water for fire protection, domestic, and process use, supplied from an elevated storage tank with a minimum capacity of two hours of fire water flow at the maximum anticipated water demand, including peak domestic and process water demands. Calculations for fire protection supplies have been based on a supply elevation of 1306 feet. Distribution piping for the site is a looped 12-inch main to provide improved reliability. The following information shall be used for estimating and design unless hydraulic calculations and/or flow test results support the use of improved water supply figures:

Estimated Water Supplies			
Sprinkler Feed Connection	Static*	Residual*	Flow*
CNMS	100	90	1500 gpm
*At point of feed connection to 12 inch water main			

- E. Related Sections of CNMS Specifications
 1. Division 02 – Civil
 - a. 02667 Water Lines
 - b. 02640 Valves, Hydrants, and Blowoffs

2. Division 9 - Finishing
a. 09900 Painting

3. Division 16 - Electrical
 - a. 16730 Fire Alarm Specification, Local Building Devices
 - b. 16735 CNMS Site Fire Detection and Alarm System

1.3 QUALITY ASSURANCE

A. Contractor Qualifications

1. The Fire Suppression Systems Contractor shall be regularly engaged in the design, servicing, installation and testing of fire suppression systems.
2. The Fire Suppression Systems Contractor shall submit a list with a minimum of three (3) installations of similar scope and magnitude, which were completed within the last three (3) years. This list shall be submitted at the pre-bid meeting.
3. The Fire Suppression Systems Contractor shall hold all licenses and permits necessary to perform this work.
4. The Fire Suppression Systems Contractor is required to be a recognized sprinkler vendor licensed under the State of Tennessee by the Department of Commerce and Insurance, Division of Fire Protection for the design and installation of automatic systems.
5. The design of fire protection systems shall be done under the supervision of a Professional Engineer registered in the State of Tennessee as a Fire Protection Engineer, or by a Fire Protection Technician certified as NICET Level IV. The design shall bear the stamp of the supervising Fire Protection Engineer or Fire Protection Technician.
6. Contractors shall provide information on experience, certification and licensing for specialty work e.g. water mist suppression systems if such specialty work is a part of the proposed scope.
7. Contractors shall submit with their bids a list of all proposed subcontractors whom they may be using to perform work and a list of equipment manufacturers who will provide representatives for system testing and training.
8. The Construction Manager may reject any proposed Contractor who cannot show evidence of such qualifications.

B. Sub-Contractors

1. The Construction Manager must approve all sub-contractors in writing.
2. All sub-contractors shall meet the quality assurance requirements listed for the Contractor in Section 1.3.A

1.4 SUBMITTALS

- #### A.
- Construction Manager approval is required for all submittals. After verifying all field measurements and after complying with the applicable procedures specified in the Contract Documents, the Contractor shall submit for review and approval, with such promptness as to cause no delay in the work, all technical Submittals, as specified. The Submittals shall be submitted in accordance with any appropriate General and Supplementary Conditions.

B. Data

1. Water Flow Tests: For each building or structure, Contractors shall perform a hydraulic flow test to confirm the available water supply for fire protection systems within that building, in accordance with the following:
 - a. Domestic and process water flow requirements and water tower low level elevation (1306 ft.) shall be considered in the flow test results.

- b. In addition, after reducing water supply for domestic and process requirements, only ninety percent of remaining water supply flow and pressure will be considered available for fire protection purposes.
 - c. Flow test results (including compensation for items a. and b.) shall be submitted to the Construction Manager, prior to system acceptance testing.
 - 2. Hydraulic Calculations: Contractors will submit hydraulic calculations based on the site water supply information in section 1.2.D and the fire protection system design densities identified in this specification to protect specific hazards.
 - 3. Manufacturers Catalog Data: Submit data (including catalog cuts, brochures, specifications, product data and/or information regarding UL Listings or Factory Mutual approvals) in sufficient detail and scope to verify compliance with the requirements of the contract documents. When multiple products are shown on a single sheet, Contractor will clearly identify the selected product. Components for use in radiation environments shall detail materials used in component construction.
 - 4. Material, equipment and fixture lists: A complete itemized listing of equipment and materials proposed for incorporation into the work shall be submitted. Each entry shall include an item number, the quantity and the name of the manufacturer or supplier of each item.
 - C. Shop Drawings
 - 1. Shop drawings shall be provided in the format required by the project General and Supplementary Conditions. Current AE drawings shall be provided to the Contractor and used as backgrounds for the shop drawings. Drawings shall contain no extraneous information. Drawing information should meet or exceed the requirements of NFPA 13. Marked-up copies of catalog data sheets or manufacturer's "typical" diagrams are not acceptable in lieu of the required drawings or diagrams. Plans for system testing shall be submitted for approval with shop drawings.
 - 2. Shop drawings shall include:
 - a. A drawing legend sheet identifying:
 - 1) All symbols used on the drawings, by type of device or equipment, manufacturer and manufacturers part number. This information shall correspond to the manufacturer's catalog data sheets required as part of the equipment list.
 - 2) All conventions, abbreviations and specialized terminology used on the drawings, as necessary to understand and interpret the information contained thereon.
 - 3) All color codes and device numbering systems.
 - 4) A complete drawing list/index identifying all drawings in the shop drawing package by title, drawing number and Specification cross-reference.
 - b. Plan view drawings based upon the project architectural plans and drawn to 1/8-inch scale or larger, showing:
 - 1) Name of Project.
 - 2) Location, including street address.
 - 3) Point of compass.
 - 4) Graphical scale indicator.
 - 5) Locations of all walls, partitions extending to within 18" of the ceiling, major room fixtures that may obstruct optical detectors or visible alarm appliances, ceiling obstructions, exits and anticipated fire department response points.
 - 6) Use or occupancy of each room or area (i.e., office, mechanical, storage, laboratory, etc.)
 - 7) Essential details including specialties, concealed spaces and ventilators.
 - 8) Layouts of sprinklers and/or hose systems in designated areas.
 - 9) Fabrication numbers of pipelines, locations, test pipes, drain connections, valves, hangers and other pertinent features.

- 10) Automatic sprinkler systems and other fire protection extinguishing systems on separate drawings. Do not incorporate layouts of fire protection systems on drawings that show other piping systems.

D. Material Samples

1. Material samples shall be provided concurrent with the Shop Drawing Submittal. Contractor shall provide samples in accordance with the requirements of the General and Supplementary Conditions. In addition, samples shall be submitted in original factory cartons (if applicable) with all factory documentation. Such documentation shall include evidence of UL Listing or FM approval, as required. Samples of the following items shall be included:
 - a. Sprinklers
 - b. Pressure switches
 - c. Tamper switches

E. Record Drawings

1. Record Drawings shall be maintained in accordance with the requirements of the General and Supplementary Conditions. Prior to final document turnover, all redlines shall be incorporated into the drawings electronically (in a format compatible with the ORNL site-wide documentation) to produce final, usable Record Drawings.

F. Operation and Maintenance (O & M) Manuals

1. Preliminary O & M Manuals
 - a. Preliminary O & M Manuals shall be provided with the shop drawings. The manuals will be reviewed for required content and approved or disapproved on that basis. Upon completion of the project, the Contractor shall revise the approved, preliminary manual to be consistent with the system as installed and specifically to coordinate the testing and maintenance schedule with the approved Contractor testing protocols and with the device numbers indicated on the Contractor's Record Drawings.
2. Final O & M Manuals (Including Final Record Drawings)
 - a. The Final Operations and Maintenance Manual shall constitute the basis for the on-site training sessions required elsewhere in this Section and, as such, shall be both specific to this system, containing a minimum of superfluous information, and suitable for that purpose. This manual shall be written, compiled and edited specifically for this project and the system installed. The Final O & M manual shall include copies of appropriate Record Drawings. Unedited manufacturer's catalog data sheets and/or equipment manuals are unacceptable as content for this submittal.

G. Reports

1. Test Reports (procedures and checklists) for all required tests shall be submitted in accordance with the appropriate requirements of the General and Supplementary Conditions.
 - a. The Test Reports shall include a detailed narrative description of each test/verification performed (consistent with the approved test protocols required elsewhere in these specifications), the date and time, results and the initials of the parties performing and witnessing each test/verification.
 - b. The Test Reports shall become a part of the permanent record and contain signatures of contractor's representatives involved in each phase of testing.

1.5 CONFLICTS

- A. The referenced codes and standards represent minimum requirements for items not otherwise addressed in the Plans and Specifications. The Construction Manager reserves the right to specify requirements that exceed the requirements of either, the referenced

codes and standards, typical industry practice, or both. Such differences between the bid documents and the referenced codes and standards/typical industry practice shall not be recognized as conflicts and shall not be grounds for adjustments to the contract.

- B. In the event of conflicts between these Specifications and/or the contract drawings and/or the referenced codes and standards, it is the Contractor's responsibility to notify the Construction Manager of such conflict in writing at least 7 days prior to bid. Any conflicts, which are not identified prior to bid, shall be subject to resolution, at the Construction Manager's discretion, by applying the more stringent criteria.
- C. No construction or installation will be authorized until the required submittals are received, reviewed and accepted by the Construction Manager. Any construction or installation performed without written authorization from the Construction Manager shall be entirely at the Contractor's own risk.
- D. As the specified submittals are essential to the Construction Manager's quality assurance effort and necessary to document the installation for future expansion, modification, service, testing and maintenance, overdue and/or unacceptable submittals may, at the sole discretion of the Construction Manager, result in the immediate suspension of all payments to the Contractor until such time as the problem is corrected.

1.6 CONDUCT OF WORK

- A. Contractor is to coordinate his work with the Construction Manager's Representative. All work shall be conducted during normal working hours unless operations must be interrupted or shut down for the contractor to perform his work. Under these conditions, the contractor shall coordinate with the Construction Manager's representative to ensure minimal impact on operations.
- B. No welding, flame cutting or any other type of hot work by the Contractor shall be permitted on the premises unless specifically approved in writing by the Construction Manager's Representative. It is anticipated that a welding permit procedure will be in place prior to installation.
- C. The Contractor shall maintain the site in a safe and orderly condition at all times.
- D. A material storage area will be assigned to the Contractor. The material storage area may be used for pipe cutting and threading, and component assembly. Overnight storage of material is limited to the assigned storage area. Materials brought to the work area shall be installed the same day, or returned to the assigned storage area. This area shall be kept clean and orderly. Packing materials shall be properly discarded.
- E. The Contractor shall be responsible during the installation and testing periods for any damage caused by him (or his subcontractors) or by defects in his (or his subcontractors) work, materials, or equipment. The Contractor shall pay for the necessary replacement or repair of such damage or shall make good all damage or defects in his work resulting from any cause whatsoever, replacing all damaged or defective materials and equipment with perfect items.
- F. The Contractor shall employ, on the job at all times, an individual who shall be responsible for the progress and execution of the work. Qualified workmen shall do all work. Workmanship shall be of the best standard practice.
- G. Contractor shall neither deviate from nor make any change to the approved shop drawings unless the Construction Manager specifically approves the change. Where a building,

structure, or equipment interferes with the location of this work as shown on the approved shop drawings, such conflicts shall be resolved with the Construction Manager.

PART 2 - MATERIALS

2.1 COMPONENTS

A. Product Listing and Approvals

1. As appropriate, all system components shall be listed by Underwriter's Laboratories, Inc. (UL) or approved by Factory Mutual (FM) if the component is from a category of devices that are listed/approved by UL or FM.
2. Components requiring approval shall be delivered to the project site with factory applied UL and/or FM stickers. System components, which do not meet these requirements, are not acceptable unless specifically approved in writing by the Construction Manager.

B. General

1. Use pipe, fittings and flange materials that are hot dipped galvanized and have threaded or grooved ends for dry pipe sprinkler systems.
2. Materials for inside wet pipe sprinkler systems may be non-galvanized.
3. Do not use bushings or reducing flanges in place of standard fittings.
4. Provide water control valves with supervisory switches. Provide alarm isolation valve on riser trim with supervisory switch.

C. Threaded Piping-Interior Wet Sprinkler Systems and Standpipe Systems

1. Pipe (to 1-½ inch): Steel, ASTM A53, furnace welded, Schedule 40.
2. Pipe (2-inch to 10 inch): Steel, ASTM A53 Grade A or B, ERW or seamless, ANSI B 36.10, Schedule 40.
3. Fittings (to 6-inch): Malleable Iron, ASTM A197, Threaded, and ANSI B16.3 Class 150.
4. Flanges (to 12-inch): Malleable Iron, ASTM A47 Grade 32510 or ASTM A197, threaded companion, ANSI B 16.1 Class 125.
5. Flanges (to 12-inch): Cast Iron, ASTM A126 Class A or B, threaded companion, ANSI B 16.1 Class 125
6. Trim Piping: Galvanized as per outdoor requirements.

D. Grooved Piping: Interior Wet Pipe Sprinkler systems and Standpipe Systems

1. Pipe (2 ½-inch to 12-inch): Steel, ASTM A 53 Grade A or B, ERW or seamless, ANSI B36.10, standard weight Schedule 40.
2. Fittings (2 ½-inch to 12-inch): Cast of Ductile Iron with groove and shoulders for use with EPDM rubber gasketed grooved pipe couplings, listed or approved for fire protection service.
3. Couplings (2 ½-inch to 12-inch): Clamps cast of Ductile Iron, EPDM rubber gasketed, 500 psig minimum working pressure, listed or approved for fire protection service and specific application.

E. Threaded piping: Exterior Sprinkler Systems or Standpipes and Interior Dry Pipe Sprinkler Systems

1. Pipe (to 1 ½-inch): Steel, ASTM A53, furnace welded, Schedule 40, Galvanized, and ASTM A153.
2. Pipe (2-inch to 10-inch): Steel, ASTM A53 Grade A or B, ERW, Schedule 40, Galvanized, ASTM A153
3. Flanges (to 12-inch): Malleable Iron, ASTM A47 Grade 32510 or ASTM 197, threaded, ANSI B36.10, standard weight, Galvanized, ASTM A153.
4. Flanges (to 12-inch): Malleable Iron, ASTM A47 Grade 32510 or ASTM 197, threaded, ANSI B36.10, standard weight, Galvanized, ASTM A153.

- F. Grooved Piping: Exterior Sprinkler Systems and Standpipes and Interior Dry Pipe Sprinkler Systems:
1. Pipe (2 ½-inch to 12-inch): Steel, ASTM A53 Grade A or B, ERW, or Seamless, ANSI B36.10, standard weight, Schedule 40 Galvanized, ASTM A153.
 2. Fittings (2 ½-inch to 12-inch): Cast of Ductile Iron, with groove and shoulders for use with EPDM rubber gasketed, grooved pipe couplings, listed or approved for fire protection service.
 3. Couplings (2 ½-inch to 12-inch): Clamps cast of Ductile Iron, Galvanized, EPDM rubber gasketed, listed or approved for fire protection service and specific application.
 4. Unions (to 2-inch): Malleable Iron, ASTM A197, threaded, Brass-to-Iron seats, ANSI B16.39 Class 150, Galvanized, ASTM A153, for valve trim and drains.
- G. Gaskets: non-asbestos, red rubber sheet, ASTM D2000 M2AA507A13, 1/16-inch thick, full face, ANSI B16.21, SEPCO No. 20
- H. Bolts: Steel, ASTM A307 Grade A or B, Heavy hex head.
- I. Nuts: Steel, ASTM A563, Grade A, heavy hex.
- J. Joint Compound: Tyte Unyte, J.C. Whitlam Manufacturing Co., Rectorseal No.5, Rectorseal Corporation, or Teflon PTFE thread seal tape, SEPCO.
- K. Plugs: Cast Iron, ASTM A126 Class A or B, square head, threaded, ANSI B16.14, Galvanized, ASTM A153.
- L. Valves-various- (See descriptions for specialty fire suppression system valves),

Service	Size (inch)	Manufacturer/Model	End Type
Shutoff			
Gate	1/4to1/2	Milwaukee 148-UL	Screwed
Butterfly	1/2 to 2	Milwaukee BB-FP-UL	Screwed
Gate	1/2 to 2	Crane No. 459 (OS&Y)-UL	Screwed
Gate	2 ½ to 12	Milwaukee 1552CB2-UL (OS&Y)	Flanged
Control			
Angle	1/4 to 2	Milwaukee 582M-UL	Screwed
Globe	1/4 to 2	Milwaukee 590-UL	Screwed
Check			
Swing	1/4 to 2	NIBCO T-413W-UL	Screwed

Swing	2 1/2 to 12	Milwaukee F-2971-UL	Screwed

- M. Valve Stem Packing: non-asbestos, manufacturers standard.
- N. Sprinkler Head: UL-Listed standard type, configuration of head and deflectors listed for purpose and location. Provide high temperature and special design heads where called for in Appendix A.
- O. Flexible Sprinkler Fitting (For Cleanroom Ceilings):
1. Clean-Flex. Model 177-28-75. 1 in. nominal dia. Flexible metal hose for providing a connection to automatic sprinklers in cleanrooms. For use in cleanroom ceilings manufactured by CLEANPAK International.
 2. FLEXHEAD Model CRG 0072. 1 in. nominal dia. Flexible metal hose for providing a connection to automatic sprinklers in cleanroom ceilings. For use in cleanroom ceilings manufactured by Gordon Inc. or approved equal.
- P. Hangers: Where possible, use C-clamps (including beam and large flange clamps) as illustrated in NFPA 13, to attach hangers to building structures. Clips shall be used, as necessary, to prevent movement due to water hammer, vibration or seismic activity.
- Q. Dry Pipe Valves (Dry Pipe Sprinkler Systems): UL-Listed dry pipe valves, complete with galvanized trim including priming chambers (accelerators and exhausters, as required by NFPA 13) and pressure operated electric switches. Gem Model F 302 or F3021.
- R. Alarm Check Valves (Wet Pipe Sprinkler Systems): UL-Listed alarm check valves, complete with galvanized trim package, including retard chambers and external bypass. Gem Model F20, F200, or F2001.
- S. Standpipe Outlet Valves: Elkhart Brass Company, Model U25 angle valve - female inlet 1 1/2 inch or 2 1/2-inch NPT, Male outlet 1 1/2 inch or 2 1/2-inch, National Standard Hose Thread - Finish to be cast brass, to be supplied with optional brass cap, with rocker lug fittings, connected by chains.
- T. Flow indicator: Switch, water-flow (paddle type), two single pole, double throw, snap acting switches, adjustable retard range from 0 to 90 seconds.
- U. Low level air switch (Dry pipe sprinkler systems): Complete with adjustable range of 10 to 130 psi; proof pressure range of 300 psi; two single pole, double throw, snap-acting switches, United Electric Control Co., Type J33AX, Model 5835.
- V. Air Compressor (Dry Pipe Sprinkler Systems): Shall have sufficient capacity to restore normal system air pressure plus 25% in system within 30 minutes. Shall be equipped with pressure switches to automatically start and stop the compressor at pressures to be determined in during detailed system design. Shall be electric drive, 115/230 V, 60 Hz, single-phase, complete with starter, motor overload protection, necessary relief valves, drain valves, internal piping, wiring and tank. Oil used in air compressors shall be PCB-free.
- W. Alarm Water Pressure Switch (Wet and Dry Pipe Sprinkler and Standpipe Systems): Adjustable range of 2 to 20 psi; 300 psi proof pressure; two single-pole, double throw, snap-acting switches, United Electric Control Co. Type J33AX, Model 5355.

- X. Dielectric pipe coupling (for use in EMI sensitive areas as identified in Appendices: Watts Model 3200, Flanged fittings, with type GB gasket, acceptable for use in radiation environment.
- Y. Ball Valve with Supervisory Switch (required in trim piping of wet or dry sprinkler systems to allow supervision and maintenance or service on alarm attachments): Potter BVS-1/2 inch Stock No. 1010150, with NEMA 4 enclosure.
- Z. Water Motor Mechanical Alarms: UL listed water motor mechanical alarms.
- AA. Backflow Preventer: FEBCO Model 860, 880 or 880V (with model 601 air gap kit) sized same as incoming feed or system piping at inlet, unless otherwise shown adequate by hydraulic calculation and approved by the CM. Indicating Isolation valves shall be installed on each side of the backflow preventer, and provisions for full flow testing per NFPA 13 and NFPA 25 shall be provided.
- BB. Valve Supervisory Switch: UL listed supervisory switch.

PART 3 - EXECUTION

3.1 DESIGN AND INSTALLATION

- A. General Information
 - 1. The Construction Manager's representative will be considered the authority having jurisdiction over final approval of drawings, interpreting of codes, inspection of finished system and witnessing of tests.
 - 2. The Contractor shall be responsible to coordinate the fire protection layouts with the other disciplines to facilitate the layouts and prevent interferences. Where drawings indicate a routing for sprinkler and/or standpipe feed mains, that routing shall be adhered to unless the Construction Manager grants specific exemptions.
 - 3. Provide supports and hangers for piping and appliances, per the appropriate codes and standards (NFPA 13, 14, 20, 750, etc) and these specifications.
 - 4. In addition, systems, hangers and supports shall be designed and installed to meet seismic requirements for Category PC-1 as indicated in the Appendix of this Section.
 - 5. Arrange suppression system piping to drain through main drain valve.
 - 6. Provide any trapped section of piping with an auxiliary drain, complete with nipple and cap or brass plug. Trapped sections of piping serving a single sprinkler are exempt from this requirement.
 - 7. Provide post-indicator valves for the sprinkler and standpipe systems in the feed mains outside the buildings. Each incoming water supply will be protected from a backflow of fire protection water by the installation of a backflow preventer.
 - 8. Provide an outside screw and yoke gate valve on each side of the backflow preventer and on the supply side of sprinkler and standpipe system alarm check/check valves inside building.
 - 9. Painting of pipe is covered in specification 09900.
 - 10. Identification and Labeling (See Section 15074):
 - a. Pressure sensitive identification labels and flow arrows for fire protection systems shall be used to identify installed fire protection piping as follows:
 - b. Provide labels on straight sections of pipelines inside buildings at maximum intervals of 40 ft.
 - c. Provide labels on straight sections of pipelines outside buildings at maximum intervals of 100 ft.
 - d. Provide labels on branch lines not more than 5 ft. from main header.

- e. Provide labels on lines that penetrate walls or floors on each side of penetration not more than 5 ft. from penetration. Provide labels on banks of piping in a row, side by side, for ease of reference.
 - f. Label text letter heights shall be in accordance with NEMA Z35.1.
 - g. Labels shall be applied to surfaces that are clean, free of scale, dirt, dust and grease.
 - 11. Underground lead-ins for sprinklers and standpipe systems shall be flushed at a minimum of 10 fps prior to connection to the sprinkler system.
- B. Sprinkler System
 - 1. Design and install sprinkler systems in accordance with NFPA 13 and this specification.
 - 2. The Contractor shall refer to the architectural reflected ceiling plans for preferred locations of the sprinkler heads in areas where there are ceilings.
 - a. The sprinkler heads shown on the reflected ceiling plans are the preferred locations. This does not relieve the sprinkler contractor from following all regulatory requirements including NFPA 13 and the fire suppression specifications.
 - b. When the preferred layouts conflict with the regulatory requirements of the codes and standards, or this specification, the Contractor shall resolve with the architect/engineer.
 - 3. The design and provision of drainage facilities for sprinkler system and alarm testing is a part of the scope of this work. Sprinkler valve rooms do not have floor drains.
- C. Standpipe Systems
 - 1. Install standpipe systems in accordance with NFPA 14 and this specification
- D. Backflow Preventers
 - 1. Backflow preventers are required to be installed prior to the sprinkler or standpipe piping in each riser room. Backflow preventers shall be sized the same as the incoming piping unless hydraulic calculations show a smaller size may be used. Design will include facilities for full flow flushing of backflow preventer in accordance with NFPA 13 and 25.

3.2 CONTRACTORS 100% TEST AND CERTIFICATION

- A. General Info
 - 1. All testing shall be performed in accordance with the appropriate codes and standards (NFPA 13, 14, 20, 750, etc.) and these specifications.
 - 2. All devices shall be tested to verify proper operation and supervision.
 - 3. The Contractor's 100% test shall be conducted with the system installation complete.
 - 4. Upon completion of Testing, the Contractor shall provide written certification to the Construction Manager's Representative documenting successful completion of all required tests in accordance with these Specifications.
- B. Sprinkler System
 - 1. No special requirements at this time.
- C. Standpipe Systems
 - 1. No special requirements at this time.

3.3 FIRE SUPPRESSION SYSTEM ACCEPTANCE TEST

- A. General Information

1. It is preferred that the Fire Alarm and Fire Suppression System Acceptance Tests be conducted concurrently. Where this cannot be done, the Construction Manager shall be notified in writing. The Construction Manager shall coordinate with the Contractor to make provisions for partial testing of the systems as is and final testing of systems when construction is complete.
2. All testing shall be conducted in accordance with NFPA 13, 14, and other appropriate standards.
3. Upon completion of installation of a fire suppression system, an Acceptance Test of the fire suppression system shall be performed in the presence of the Construction Manager and/or his designated Representative(s).
 - a. In preparation for the Acceptance Test, the Contractor shall submit Record Drawings, as required elsewhere in these Specifications.
 - b. The Contractor's Record Drawings will be reviewed for conformance to the applicable Specification requirements. Upon approval of the Record Drawings, one copy will be provided to reflect the Acceptance Test plan.
 - c. The Contractor shall develop the Acceptance Test Plan in accordance with the appropriate Codes and Standards. The Test Plan shall be submitted to the Construction Manager for approval.
4. Acceptance Testing will be conducted by the contractor and witnessed by the Construction Manager's Representative, unless otherwise specified below. The Acceptance Test shall be performed in accordance with the Acceptance Test Plan. The Acceptance Test Plan shall include at a minimum:
 - a. Functional testing of 100% of interface devices that supply signals to other systems, including the Fire Alarm System. Such devices may include: pressure switches, tamper switches, water flow devices, etc.
 - b. Functional testing of 100% of system components including: alarm valves, gate valves, dry pipe valves, etc.
 - c. The fire pump acceptance test shall be performed and witnessed by the pump manufacturer's representative, the package assembler, the appropriate field construction personnel and the Construction Manager's representative. Test documentation will include signatures of all parties.
5. 100% successful performance during Acceptance Testing is expected, based on the Contractor's Installation Testing Documentation and 100% Test Certification required elsewhere in these Specifications. In the event of system performance inconsistent with the Contractor's testing certifications, the Construction Manager will make a determination as to whether or not the test results constitute failure of the Acceptance Test. Failure of the Acceptance Test shall invalidate the Contractor's System Certification, in which case re-certification (including 100% Contractor retesting) and a repeat of the Acceptance Test shall be required at no additional cost.
6. Failure of the Acceptance Test may result in the immediate suspension of all payments to the Contractor, until such time as the required Contractor's retesting/re-certification is complete and the failed Acceptance Test is successfully repeated.

3.4 BUILDING SPECIFIC REQUIREMENTS

- A. All building specific requirements, if any, are outlined in the Appendices.

END OF SECTION 15300

APPENDIX A
BUILDING SPECIFIC REQUIREMENTS

3.4.A Center for Nanophase Materials Science-Specific Fire Protection Requirements:

Area Protected	Type of Suppression System	Application Rate (gpm/ft ²) Temp. Rating And Spacing	Interface Point-Water Supply	Special Conditions And comments
Laboratory Building-All Levels	Ordinary Hazard, Group 2 Wet Pipe Sprinkler System	0.20gpm/1500 sq ft Plus +250gpm for hose: 165 degree F	Valve Area in Room B1-7-39.	FDC to be at Level B-1. FDC to serve all sprinkler and standpipe system. Floor control valves and water flow devices to be provided at each floor elevation - riser to be in stairwell. Seismic PC-1*
Clean Room and Clean Room Service Area.	Ordinary Hazard, Group 2 Wet Pipe Sprinkler System.	0.20 gpm/3000 sq ft., plus 250gpm for hose. 165 degree F.	Valve Area in Room B1-7-39.	FDC to be at Level B-1. FDC to serve all sprinkler and standpipe systems. Seismic PC-1*. Floor control valve and waterflow device to be provided for sprinkler system serving Level B1, CL. 26 to 33. Use quick response sprinklers in Clean Room areas with down-flow airstreams. Provide sprinkler coverage within and above clean rooms. Sprinklers in clean room ceiling to be connected using flexible fittings. Dielectric unions to be provided on sprinkler piping entering EMI sensitive rooms.
Loading Dock	Ordinary Hazard, Group 2 WET Pipe Sprinkler System	0.20 gpm/1500 sq ft, plus 250gpm for hose. 165 degree F.	Feed from wet pipe sprinkler system.	Requires dry type sidewall heads to prevent freezing. Seismic PC-1*
Standpipe System in stairwell of laboratory building.	Class I Standpipe system - minimum 500 gpm @ 30 psi at the 2 most remote hose connections (1000gpm total) without fire dept. assistance.	Locate riser in laboratory building stairwell, with outlets at each elevation	Combined system with sprinklers riser in stairwell.	FDC to be at Level B-1. FDC to serve all sprinkler and standpipe systems. Seismic PC-1*. Special hydraulic calculations.

Note-Sprinklers in areas with suspended ceilings shall be flush or semi recessed and approved by the A/E and the CM.

*Provide couplings, clearances, and sway bracing in accordance with NFPA 13. Minimum Lateral Seismic Force, Fp, to be used in designing sway bracing as follows:

Level B1 (single story structure): 0.20 Wp
 Level B1 (multistory structure): 0.13 Wp
 Level 1: 0.14 Wp
 Level 2: 0.17 Wp
 Level 3: 0.20 Wp
 Penthouse: 0.20 Wp

Where Wp = weight of water filled piping

Lateral seismic force is effective at ceiling elevations. Lateral forces at lower elevations may be reduced where supported by calculations in accordance with Equation 16-67 and 16-69 of the 2000 International Building Code.